USE AND MANUFACTURE OF FIELD ARTILLERY IN THE CONFEDERACY

JUSTIN A. STANAGE
Communicated by: Dr. Glenn F. Chesnut
Department of History

ABSTRACT

This paper explores what the main types of field artillery used in the American Civil War were, how they were made, and the ammunition used. This paper will also touch upon how this field artillery demonstrated the manufacturing capability of the Confederate States of America.

Artillery is known as "The queen of the battlefield." There is more, though, to artillery than just how it was used on battlefield. To fully understand artillery one must look at how the guns were made, what they were made from, where they were made, and the ammunition that they fired. These factors, in addition to the gun design itself, helped to determine what the weapon was capable of.

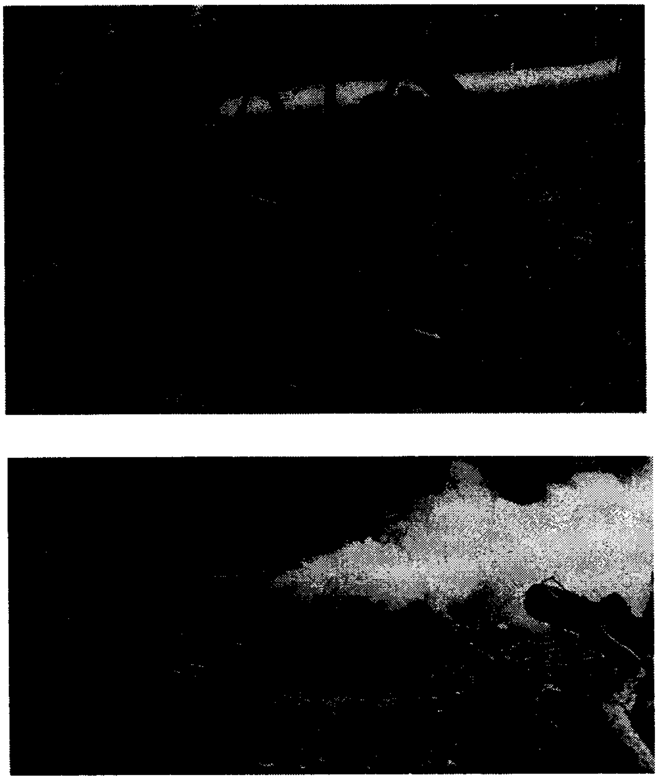
Of all the types of field artillery that were used during the Civil War, three stand out as perhaps being the most famous domestically manufactured types. These were the 12-lb Napoleon, the Parrott Rifle, and the Ordnance Rifle. These weapons had several things in common. The first was that they were all muzzle-loaders. The second involved the basic types of ammunition they used. The third was the methods of manufacturing.

In the North, the smoothbore Napoleon was officially designated the "light 12-pounder gun" (Hazlett 88). This weapon weighed about 1,200 pounds and had a bore diameter of 4.62 inches, meaning that the hollowed portion of the tube was 4.62 inches in diameter, and a tube length of 64 inches (Ibid. 88) (See figures 1&2). The amazing thing about this weapon is that while it was a preferred weapon of artillerymen, at the start of the war very few existed in the United States, as it had only been developed within ten years of the start of the war. There were only five pieces, one of which was considered defective. At the time of the first major battle, First Bull Run, only four more had been added to the arsenal (Ibid. 89). Production would increase and by the beginning of 1862 the Union had 36 Napoleons in its possession. From 1856 to 1864, the North would produce some 1,157 Napoleons. The South produced at least 535 Napoleons for service during the war (Ibid. 91, 107).

The Confederacy produced a great many Napoleons, the majority out of bronze. The copper that was used in the making of the bronze Napoleons at the famous Tredegar Iron Works of Richmond, Virginia, came primarily from one source: The Ducktown mines near Chattanooga Tennessee (Daniel 11). Each Napoleon produced by Tredegar, and presumably most other foundries, required over 1000 pounds of copper. At the recommendation of General Robert E. Lee, bronze cannons that fired lighter shot, such as the 6-pounder, were melted down and turned into Napoleons, which were more effective weapons. The last source of bronze for cannons was bells. This was not a good source of material, however. The alloy of bronze used to make cannons was known as gunmetal, which was traditionally 90 percent copper and 10 percent tin (Hazlett 107-108). If this is indeed true, then guns made from bells would have had to have some copper added, as it would be difficult to work, bell-metal consisting of 78 percent copper and 22 percent tin (Ibid. 108). Therefore, it is next to impossible to tell bell metal guns from those made from raw copper.

Unfortunately for the Confederacy, the Ducktown mines were taken in November of 1863 by the Union. This ended bronze Napoleon production in the South. This did not end Napoleon production, however. In 1864, Tredegar started to produce iron Napoleons (Daniel 15). These were manufactured in a similar fashion as the Parrott Rifles, out of "cast iron with wrought iron reinforcing band[s]" (Hazlett 107) (See figure 3). While 120 of these guns were produced by the South before the end of the war, this method of manufacturing had its drawbacks, as will be explained later.

Turning attention to the rifled guns, the two primary ones used by both sides were the 3-inch Ordnance Rifle and the Parrott Rifle. The rifled cannon had three distinct advantages over the smoothbore. The first was the range that these weapons could attain. The smoothbore Napoleon could reach a range



Figures 1 & 2: Bronze Napoleon.
Specifications: Bore Diameter: 4.62"
Length of Tube: 66"
Weight of Tube: 1,227 lbs.
Powder Charge: 2.5 lbs.
Range at 5 degrees elevation: 1,619 yds.
(Thomas 28)

of 1,619 yards at a 5 degree elevation, while the 10-Pounder Parrott and the 3-Inch Ordnance Rifle could reach 2,000 yards and 1,835 yards respectively (Thomas 28, 33, 39).

The second advantage was the rifling, which allowed the elongated projectile to spiral and thus maintain a more accurate course to the target. The smoothbore Napoleons had spherical ammunition that bounced down the barrel, leaving at whatever trajectory was given it by the last bounce at the end of the barrel. Thus, at greater ranges it was quite difficult to hit a target. One celebrated exception was when the Confederate artilleryman "Pelham hit a Union standard-bearer at 800 yards with one shot" (Coggins 65). While this might not seem greatly difficult, the deviation of the ball in flight was 3 feet at 600 yards and 12 feet at 1,200 yards (Ibid. 66).

Figure 3: Cast Iron Napoleon.
Specifications: Bore Diameter: 4.62"
Length: 66" (Unsure)
Weight: 1,249 lbs. (Estimated)
Powder Charge: 2.5 lbs.
Range: 1,619 yrds

The third advantage to the rifled guns was that, shot for shot, they used less gunpowder than the smoothbores. The reason for this was the windage that the smoothbores had. What this meant was that a portion of the force from the exploding gunpowder would pass around the ball and not propel it. In the rifled guns, the conical shot was more tightly fitted to the bore which considerably reduced the windage. When this was combined with the shape itself of the conical shot, which retained velocity better than the round shot fired from the smoothbore, less powder was required to propel the shot. This allowed a reduction in the weight of the gun as the amount of force on the breech was considerably lessened (Coggins 65, 76). As a more direct comparison in gun weight, the 14-Pounder James Rifle fired a slightly heavier shot than the Napoleon, but the gun weighed 300 pounds less and used 1.75 pounds less gunpowder (Thomas 28, 42) (See figure 4).

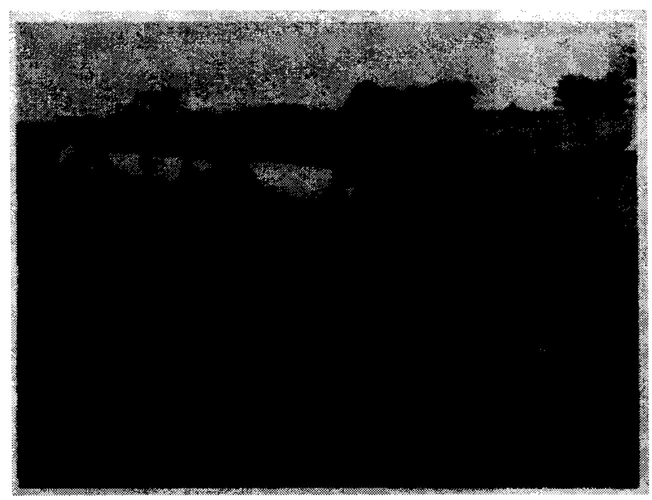


Figure 4: 14-Pounder (3.5-inch) James Rifle.
Specifications: Bore Diameter: 3.8"
Tube Material: Bronze
Length of Tube: 65"
Weight of Tube: 918 lbs.
Powder Charge: 0.75 lbs.
Range at 5 degree elevation: 1,700 yrds

Looking at the weapons themselves, the 10-Pounder Parrott and the 3-Inch Ordnance Rifle are fairly similar. They could fire the same type of ammunition, had comparable ranges, and were within a few inches the same length and were within a few pounds in weight of each other. While they are known by different nomenclatures, the bore diameter was almost identical. The difference in name was that the Ordnance Rifle was known by the bore diameter, while the Parrott was known by the weight of the shot it fired. The primary difference was in the materials used in manufacturing these weapons.

All forms of the Parrott Rifle, from the 10-Pounder and 20-Pounder field guns to the monster 300-Pounder were manufactured from the same materials (See figures 5&6). The

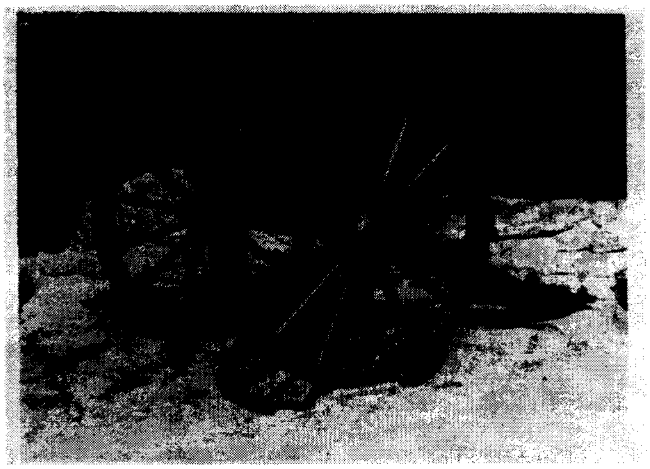
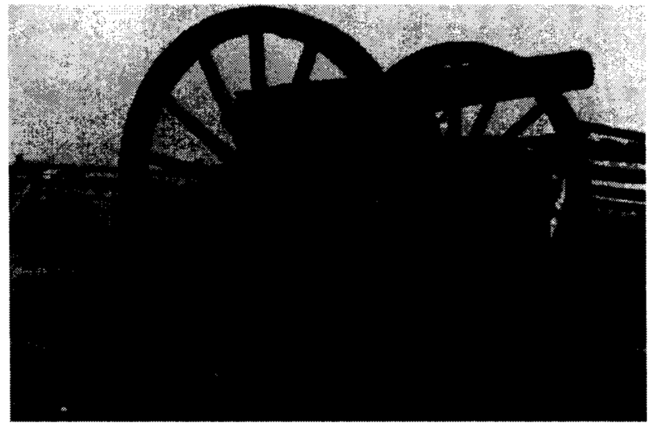


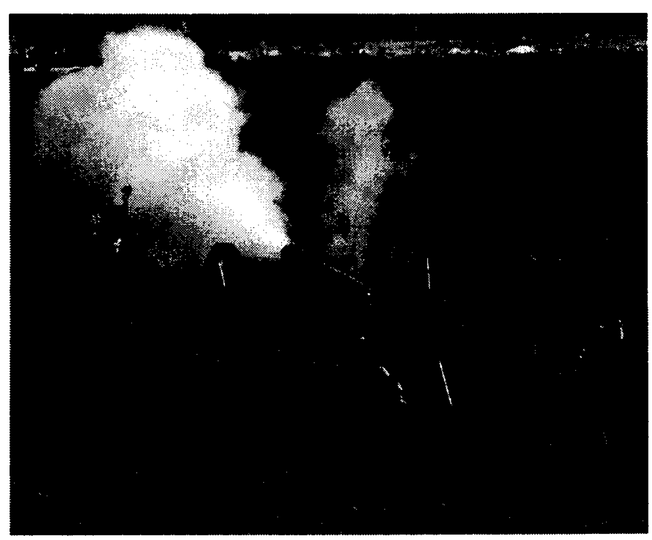
Figure 5 & 6: 10-Pounder Parrott Rifle.
Specifications: Bore Diameter: Model 1861:2.9; Model 1863: 3.0"
Tube Material: Iron
Length of Tube: 78"
Weight of Tube: 890 lbs.
Powder Charge: 1 lb.
Range at 5 degree elevation: 2,000 yrds
(Thomas 33)

Not Shown: 200-Pounder Parrot Rifle (Seacoast Gun; no picture available)
Specifications: Bore Diameter: 8.0"
Tube Material: Iron
Length of Tube: 159"
Weight of Tube: 16,300 lbs.
Weight of Projectile: 175 lbs.
Powder Charge: 16 lb.
Range at 5 degree elevation: excess of 8,000 yrds
(Thomas 53)

main tube was made from cast iron while the breech, or rear of the cannon, had a wrought iron reinforcing band placed over it. While the reinforcing band would offer greatly increased strength, this did not always help. Many of the Parrott rifles burst in front of the band. In one famous incident, a 200-Pounder siege gun named the "Swamp Angel" burst when it fired its thirty-sixth shot (Thomas 33, 53). In another incident, two confederate 30-Pounder Parrotts burst at Fredericksburg in December 1862. One burst on the thirty-ninth shot and the other on the fifty-fourth (Daniel 12).

A weapon similar in size to the 10-Pounder Parrott was the 3-Inch Ordnance Rifle. Unlike the Parrotts, this weapon was made from wrought iron instead of cast iron (See figures 7, 8 & 9). While it had a shorter range, the Ordnance Rifle was both shorter and lighter. This made it easier to maneuver on the battlefield, and it still delivered comparable performance (Thomas 33, 39). The wrought iron Ordnance Rifle had a significant advantage over the Parrott, the very material it was made from. Wrought iron was about four times stronger than cast iron, meaning it could take a greater initial shock from





Figures 7, 8 & 9: 3-Inch Ordance Rifle.
Specifications: Bore Diameter: 3.0"
Tube Material: Wrought Iron
Length of Tube: 73"
Weight of Tube: 816 lbs.
Powder Charge: 1 lb.
Range at 5 degree elevation: 1,835 yrds
(Thomas 39)

the exploding gunpowder. At the same time, it was about twenty-two times more durable than cast iron, which would allow the Ordnance Rifle to withstand the punishment of active service longer. Wrought iron had an advantage over gunmetal as well. It was three times stronger and five times as durable ("About Cannon" 600). A case in point is the initial proving of the weapon. When at the end of the proof firing in 1856 the gun remained undamaged, the inventor of the weapon, John Griffen of the Phoenix Iron Company, challenged Captain Alexander Dyer of the Ordnance Department to burst his gun. After 500 firings, it remained undamaged. It took seven pounds of powder and thirteen shots to finally burst the gun. This was the maximum that the barrel could physically hold. Four more guns were tested in 1857 and all passed with equal success (Hazlett 120-121).

The materials that cannons were made from was only half the story. The other half is how those materials were turned into finished cannons. For the bronze and the cast iron guns, the majority of the process was the same. A wooden model was first created that was a little larger than the finished gun would be, but with an extension at the muzzle known as a "dead-head." This provided extra metal to maintain correct size when the gun shrank during cooling, and helped generate increased pressure at the breech, strengthening it against the shock of firing (Thomas 7).

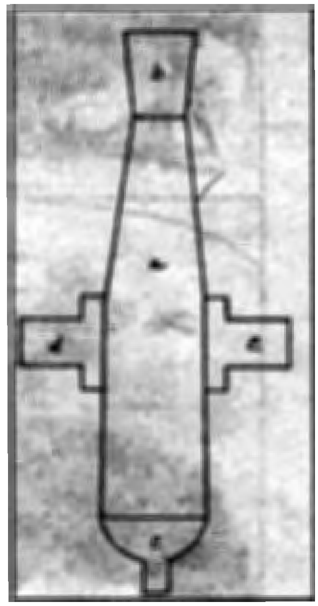


Figure 10: Gun Model
a) Tube
b) Dead-head
c) Breech
d & e) Trunnions

Figure 11: Cross section of a gun flask.

The next thing done was the creation of a "flask," which was made from segments of sheet iron held together by nuts and bolts. This held a "mould" made of hard refractory sand and water moistened clay. To make the mould, the model was stood upright, the material was packed around it, and the flask was built up piece by piece. When this was done, the flask was split lengthwise and the model removed. A "cokewash" of water and powdered coke was then brushed over the two halves of the mould, ensuring a smooth surface and preventing molten metal from sticking to it. It was then baked hard in an oven (Thomas 7) (See figures 10, 11, & 12).

To cast the gun, the flask was rejoined and the mould was placed breech down in a pit. Molten metal was then poured in, charcoal was spread on top to prevent oxidation, and it was given several days to cool. Once this was done, the gun was removed from the mould and the sand was cleaned off. The dead-head was removed and the gun was bored out. After that the trunnions were cut and finished, followed by the vent, where the primer was placed that was used to ignite the main powder charge being bored out. If it was intended to be a smoothbore, it was sent to inspection at that point, otherwise it was rifled and then sent to inspection. If it failed, the gun could be melted down and recast (Thomas 7). When producing the Parrott, several hoops of iron were hammer welded together into a solid band, heated to expand, and then slid over the breech. Once cooled, the band would shrink and produce great pressure on the breech, reinforcing it.

The 3-Inch Ordnance Rifle was produced in a different manner than the method previously described. The essential

Figure 12: "In January, 1864, during the approach of the Kilpatrick-Dahlgren raiders, the rough iron casting for an unidentified weapon of field piece size was dumped, still within its founder's flask, into the river to avoid capture. Both, recently recovered and separated, are on display at the site today. The casting is still complete with the only known 'gun head' or 'shrink head' to survive from the Civil War." The site mentioned is that of the Bellona Foundry, which was located on the James River in Chesterfield County, Virginia. They were recovered in 1961 (Hazlett 53).

description from the 1855 patent reads:

> A pile of wrought-iron rods 7/8 inch x 7/8 inch x 4 ½ feet were welded together to form a mandrel. A long bar 3/4 inch x 4 ½ inch was wound spirally around this by revolving the lathe. Three successive layers were thus applied to the mandrel, each layer spiraling in a direction opposite to the previous one. A thin layer of staves was applied to the outside, and a plug driven to form the breech. Welding heat was then attained and the mass was rolled out to the length of seven feet. Trunnions were welded on and the gun was bored and rifled from the solid. (Hazlett 120)

Despite the material differences, each type of gun often would burst in a similar manner. While the cracks that cause the gun to burst do not always follow the same path, they usually do. They would begin at the vent and spread forward to the trunnions, where the gun tube was connected to the carriage, where they would split off and form a right angle across the gun. The part forward of the crack would go flying forward, doing somersaults and usually end up facing what remained of the gun crew ("About Cannon" 603). With this being the case, it can be inferred that the breech band on the iron Napoleons and the Parrott Rifles were not greatly effective in preventing guns from bursting (See figure 13).

When looking at projectile weapons, one must also look at the ammunition they fired. Both the rifles and smoothbores of the field artillery used the same basic types of ammunition. These were solid shot, common shell, case shot, and cannister, which will be defined later. Solid shot was formed into a round ball for smoothbores and an elongated bolt for rifles. Both were useful in the anti-materiel role, but the round ball had an advantage over the bolt. It could be made to ricochet across open terrain, while the bolt would burrow into the ground at the point of impact (Thomas 16) (See figures 14 & 15).

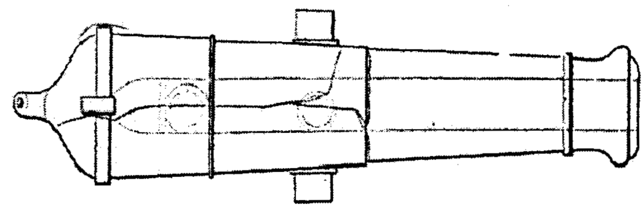


Figure 13: Typical bursting pattern, as illustrated in the 19th century.

Whether it was cast in a spherical or conical shape, common shells were simply hollow projectiles filled with gunpowder. Shells were primarily intended to explode over their target, spreading ragged fragments. The methods employed were a time fuse or a percussion fuse. Time fuses were usually made from paper and marked as to how long it would burn. These fuses were lit by the flame from the exploding gunpowder propellant. Percussion fuses were basically a percussion cap mounted on a moving slider. When the gun was fired, the slider would be kept in place by inertia. At impact, the slider flew forward and hit a stationary piece called the anvil. This would crush the cap and set off the main charge. If the impact was not strong enough, the slider would not strike hard enough to set off the cap, resulting in a dud (Thomas 16).

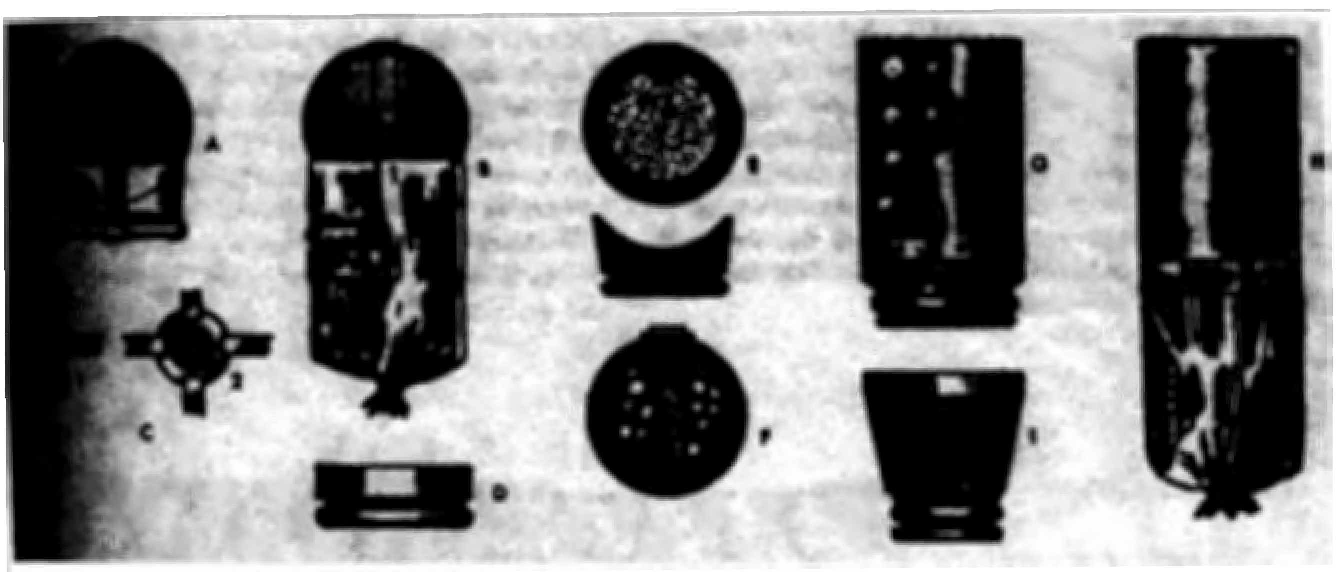


Figure 14: Smoothbore Ammunition.
- A) Solid shot attached to wooden sabot with straps.
- B) Shell-complete fixed round. Cartridge bag tied to sabot. Paper bag in place.
- C) Arrangement of straps for shot (1) and shell (2) (opening allowed for fuse).
- D) Cartridge block for separate cartridge. Projectile and powder charge for rounds for guns larger than 12-pounders were usually loaded separately.
- E) Shell and sabot.
- F) Spherical case: 12-pounder. contained 4.5-ounce burster and 78 musket balls.
- G) Canister: 12-pounder contained 27 cast-iron shots, average weight is 0.43 pounds in tin case, nailed to sabot.
- H) Complete fixed round of canister. Paper bag was torn off before loading.
- I) Tapered sabot for howitzers (powder chamber in howitzers was smaller than the bore).

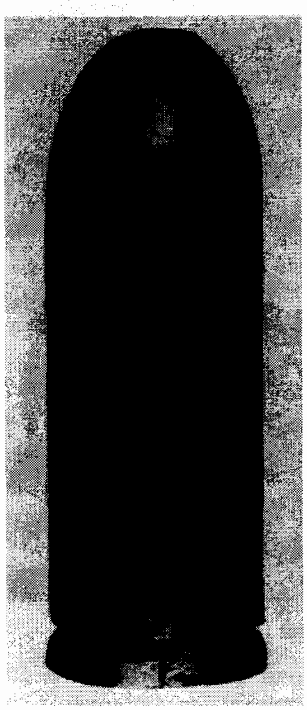


Figure 15: 10-pounder Parrott shell, U.S., zinc fuse plug.
Weight: 9 lbs.
Diameter: 2.88"
Length: 8.5"

Case shot was also known as "shrapnel." This special kind of shell was made with thinner iron walls than common shell and was filled with iron or lead balls in a sulphur or asphalt matrix. The bursting charge was not as large as that the of common shell, which effectively prevented them from using percussion fuses, because the bursting charge was not strong enough to be effective if the shell was buried in the ground (Thomas 17).

Canister was the last of the principle types of ammunition used by field guns during the Civil War. This effectively turned the cannon into a giant shotgun, firing a cone of iron balls up to 400 yards. Made from a tinned iron cylinder and packed with sawdust, the Napoleon canister contained twenty seven 1.5 inch diameter balls (Thomas 17). This ammunition was more useful with the smoothbores than with the rifles. "The rifled barrel tended to throw the canister balls into an erratic, spiraled pattern" (Ibid. 33). This prevented a good cone of fire from forming, significantly reducing the swath the canister cut through the attacking men.

The Confederacy was thought of as being an agrarian nation, but this was not so. While the industrial output was considerably less than that of the Union, it was still quite significant. While cannons were only a part of the manufacturing capacity of the Confederacy, they indicate the production capability of the Confederate states to have been much greater than they were given credit for. The Confederacy produced over 2,300 cannons during the course of the war. Half of these were produced at Tredegar. This was in spite of the difficulty in shipping raw materials, the disruptions caused by Union armies, and the demands of other forms of war production (Daniel IV). The supply of good quality iron came in large part from the Cloverdale furnace, roughly 120 miles west of Richmond. When Cloverdale was captured by Union forces, Tredegar had to use inferior Liberty, Virginia iron, reducing the quality and quantity of guns that they could produce (Ibid. 15). Both furnaces were located near the Shenandoah River Valley, which was the bread basket of the Confederacy (Winkler 39). Thus, when the Union forces moved through there in 1864, it severely reduced the iron supply. In addition to the disruptions caused by the enemy, the demands on Tredegar stretched its resources rather thin. These demands included the production of the iron armor for Confederate ironclads such as the Virginia. When the steam frigate Merrimack was raised from the bottom of the Norfolk Naval Base by the Confederates and turned into the iron clad Virginia, only Tredegar was capable of rolling the amount of iron needed for the armor (Freeman 18). All this required rather considerable industrial capacity, for cannons required considerable manpower and raw materials to produce, while simulatiously the Confederacy had to produce other implements of war, such as rifles and uniforms, as well as some civilian production.

Tredegar had many years of experience producing cannons before the Civil War. It first received orders from the U.S. Navy in 1843, and had delivered 881 guns by 1860. The firm first cast Parrotts in late 1861 and received orders to produce Napoleons in 1862 (Daniel 3, 10). While it is difficult to determine the exact numbers of guns produced, it is estimated that Tredegar produced 612 field artillery pieces, which included many different types. As a comparison, the two largest Union foundries, the West Point Foundry and the Phoenix Iron Company, produced 806 and 857 field guns, respectively. Also, by December 1862 the Union foundries had produced between them approximately 600 Napoleons and 370 Parrott field guns (Ibid. 93,10).

While Tredegar is the most famous of all the Confederate foundries, there were a great many others. There were over fifty different foundries that existed, some of which are known today only from the name engraved on surviving guns. Others have no surviving guns, or produced only ammunition (Daniel 85-90). At least nineteen of these existed before the war, although not all were producing cannons (Ibid. 3-70).

In addition to the various private foundries, the Confederate government owned five different cannon foundries. The principal foundry in the west were the ones at Augusta, Macon, and Columbus, Georgia. Part of the reason for this was the need for suppliers closer to the armies, as by 1862 most of the private western foundries had been captured by the Union (Daniel 61-62). Tredegar could have been a sixth, as the owner offered it to the Confederate government shortly after the fall of Fort Sumpter. The government, however, declined the offer and Tredegar remained in private hands throughout the war (Hazlett 4).

The Charleston Arsenal was one of the first Federal foundries to be taken by the Confederacy. While it produced very few actual cannons, it issued 16,000 rounds of ammunition for the heavy artillery and made three million small arms cartridges. It also repaired small arms and heavy cannons. While it was possible that the cannons produced in Charleston were sub-contracted to a local foundry, it is more likely that they were produced at the Arsenal itself (Daniel 66).

The Columbus Arsenal was originally in Baton Rouge. When New Orleans fell in April 1862, it was moved to Columbus, Georgia. It produced Napoleons and 9-Pounder smoothbores for the Confederate army, at least eighty different guns (Daniel 68-69). The Macon Arsenal was originally the Findlay Iron Works until it was bought by the Confederate government. Until then it had produced railroad components, including car wheels and steam engines. By 1862, it was producing 6-Pounders and 12-Pounder Howitzers. After November 1862 it was producing Napoleons and Parrotts (Ibid. 70).

The last government foundry had very little to do with field artillery. The Selma Naval Gun Foundry was built in Selma, Alabama. It began casting artillery in 1863, concentrating on the Brooke gun. It also produced nineteen mortars, twenty 6-Pounders and at least twelve 30-Pounder Parrotts. Of the Brooke gun, no less than 102 were produced, in much the same manner as the Parrott. The primary difference was that the Brooke had a second breech band over the first, although it had the same habit of bursting. In one incident, a Brooke burst at Mobile on its 55th shot. To help ascertain the strength of the iron that was used at the foundry, the 6-Pounders were all burst on purpose (Daniel 75-80).

The field artillery of the Civil War played a major role in the outcome of the war. The guns themselves could only do so much, however. It took the men at the foundry to create them and the men on the battlefield to bring them to life. In the final analysis, the Confederacy was not as agrarian as is thought, having produced over 2,300 cannons of various sizes and types. Small arms can be produced almost anywhere, in almost any quantity. It requires a large amount of industry concentrated in one place to produce cannons.

REFERENCES

"About Cannon." *Harper's New Monthly Magazine.* October 1862: 589.

Coggins, Jack. *Arms and Equipment of the Civil War*. New York: Barnes & Noble Books, 1990.

Cole, Daniel T. P.O. Box 13681 Albany, NY 12212. Taken at the 135th Gettysburg Re-enactment.

Daniel, Larry J., and Riley W. Gunter *Confederate Cannon Foundries.* Union City, TN: Pioneer Press, 1977.

Freeman, Fred. *Duel of the Ironclads* New York: Time-Life Books, 1969.

Hazlett, James C., Edwin Olmstead, and M. Hume Parks. *Field Artillery Weapons of the Civil War*. Newark: University of Delaware Press, 1988.

Thomas, Dean S.. *Cannons, An Introduction to Civil War Artillery*. Gettysburg, PA: Thomas Publications, 1985.

Winkler, "Virginia's Age of Iron." *Blue Ridge*, December 2000, 39.

IMAGE SOURCES

Figure 1: Cole, Daniel T. P.O. Box 13681 Albany, NY 12212. Taken at the 135th Gettysburg Re-enactment.

Figure 2: Cole, Daniel T. P.O. Box 13681 Albany, NY 12212. Taken at the 135th Gettysburg Re-enactment.

Figure 3: Daniel, Larry J., and Riley W. Gunter *Confederate Cannon Foundries*. Union City, TN: Pioneer Press, 1977: 10, 28.

Figure 4: Thomas, Dean S. *Cannons, An Introduction to Civil War Artillery*. Gettysburg, PA: Thomas Publications, 1985: 42.

Figure 5: Thomas, Dean S. *Cannons, An Introduction to Civil War Artillery*. Gettysburg, PA: Thomas Publications, 1985: 33.

Figure 6: Cole, Daniel T. P.O. Box 13681 Albany, NY 12212. Taken at the 135th Gettysburg Re-enactment.

Figure 7: Thomas, Dean S. *Cannons, An Introduction to Civil War Artillery*. Gettysburg, PA: Thomas Publications, 1985: 39.

Figure 8: Cole, Daniel T. P.O. Box 13681 Albany, NY 12212. Taken at the 135th Gettysburg Re-enactment.

Figure 9: Cole, Daniel T. P.O. Box 13681 Albany, NY 12212. Taken at the 135th Gettysburg Re-enactment.

Figure 10: Thomas, Dean S. *Cannons, An Introduction to Civil War Artillery*. Gettysburg, PA: Thomas Publications, 1985: 7.

Figure 11: Thomas, Dean S. *Cannons, An Introduction to Civil War Artillery*. Gettysburg, PA: Thomas Publications, 1985: 9.

Figure 12: Daniel, Larry J., and Riley W. Gunter *Confederate Cannon Foundries*. Union City, TN: Pioneer Press, 1977: 21.

Figure 13: "About Cannon." *Harper's New Monthly Magazine.* October 1862: 603.

Figure 14: Coggins, Jack. *Arms and Equipment of the Civil War*. New York: Barnes&Noble Books, 1990:67.

Figure 15: Thomas, Dean S. *Cannons, An Introduction to Civil War Artillery*. Gettysburg, PA: Thomas Publications, 1985: 34.

JUSTIN A. STANAGE is a History major concentrating in American History. He plans to graduate in May 2002. This paper was written for H217, *The Nature of History*, taught by Dr. Chesnut. He is interested in Civil War history because he has been to many battlefields in the U.S., including Hampton Roads and Gettysburg.